

Prevalence and Consequences of Barriers to Primary Health Care

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Authors

Dr Mona Jeffreys, Dr Kirsten Smiler (Te Whānau a Kai, Te Aitanga-a-Māhaki, Rongowhakaata, Te Whakatōhea), Dr Lis Ellison Loschmann (Te Āti Awa, Ngāi Tahu, Ngāti Toa Rangatira and Ngāti Raukawa), Dr Megan Pledger, Dr Jonathan Kennedy, Dr Jacqueline Cumming

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Executive summary

Introduction

Primary health care provides essential health promotion, preventative, diagnostic and treatment services to the population. As the intended first point of contact with the health and disability sector, equity in health outcomes in Aotearoa New Zealand is heavily influenced by the effectiveness of the primary health care system.

At the centre of the primary health care system's responsibility to serve the population is accessibility. Access to health care refers to the attributes of the health services themselves, the characteristics of the providers and the processes of care which enable those requiring it to seek and obtain care. Inequities within the provision of primary health care contribute to the significant health inequities that exist in Aotearoa New Zealand. Despite some improvement from previous policy actions, barriers to primary health care remain prevalent and disproportionately affect Māori and Pacific children. This report focuses on access to general practice which is one key part of primary health care.

Context

In Aotearoa New Zealand, primary health care is largely provided by general practices, particularly general practitioners (GPs). Numerous policies to improve access to general practice for children have been introduced since the mid-1990s. Zero fees for standard consultations for children under the age of six began in 1996; this was extended to cover after hours services in 2011. Since 2015, children under 14 years have been eligible for free GP visits and co-payments for dispensed prescriptions have been removed for this age group. Such benefits should be available for all children who have enrolled at a general practice.

These policies have reduced cost as a barrier to seeing a GP for children. The reduction of these cost barriers appears to have had an impact on health equity, as measured by a reduction of inequities in ambulatory-sensitive hospitalisation rates for 0-4-year olds.[1]

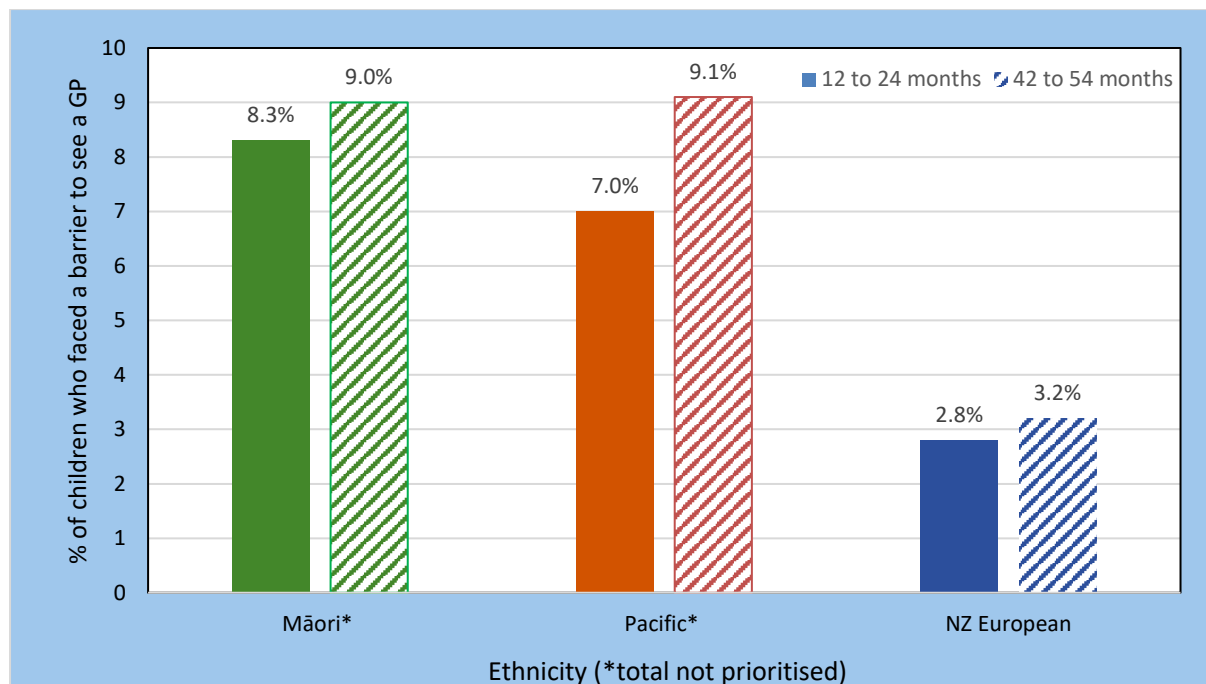
The removal of co-payments has not eliminated all barriers to seeing a GP. There may be charges for non-standard (e.g., longer) visits or for prescriptions over and above the government subsidy. Families may owe fees to the practice they visit. Furthermore, the "cost" of seeing the GP is not only the co-payment made to the practice, but also other payments, such as the cost of travel or paying alternative caregivers for other dependents, as well as the "opportunity cost", such as for time off work. These barriers are not affected by the zero-fees policy.

This study analysed the prevalence of barriers to seeing a GP at two ages, the persistence of these barriers from age 24 to 45 months, as reported by mothers of participants in the Growing up in New Zealand cohort. We also investigated whether similar barriers were experienced in accessing childhood vaccinations. Finally, we report on the consequences of experiencing a barrier to seeing a GP. Descriptive analyses were used to investigate the prevalence of barriers. Logistic regression was used to investigate the consequences of these barriers.

Findings

- Overall, 4.7% (n=279) of children experienced barriers to seeing a GP at age 12 to 24 months, and 5.5% (n=325) experienced a barrier at age 42 to 54 months, as reported by their parents. At both ages, a higher percentage of Māori and Pacific children, compared to New Zealand European children, experienced such barriers, see Figure 1.

Figure 1: Proportion of children who faced a barrier to see a GP at age 12 to 24 and 42 to 54 months



- The most common barriers to seeing a GP across all children in the cohort were:
 - not being able to get an appointment (2.4% at 24 months; 2.9% at 54 months)
 - being after hours (1.0% at 24 months; 1.3% at 54 months)
 - not having transport (0.8% at 24 months; 0.3% at 54 months)
 - not being able to spare the time (0.3% at 24 and 54 months)
 - cost (0.2% at 24 months, 0% at 54 months)
 - not being able to get in touch with the GP (0.1% at 24 and 54 months)
 - not having childcare (0.1% at 24 months, 0% at 54 months)
 - unspecified other reason (1.1% at 24 months, 0.6% at 54 months).
- For each barrier and at each age, the percentage was higher in Māori and Pacific families compared with New Zealand European families, see figures 2 and 3. The most marked barriers were not being able to get an appointment, not having transport and being after hours.

Figure 2: Type of barriers to see a GP at age 12 to 24 months.

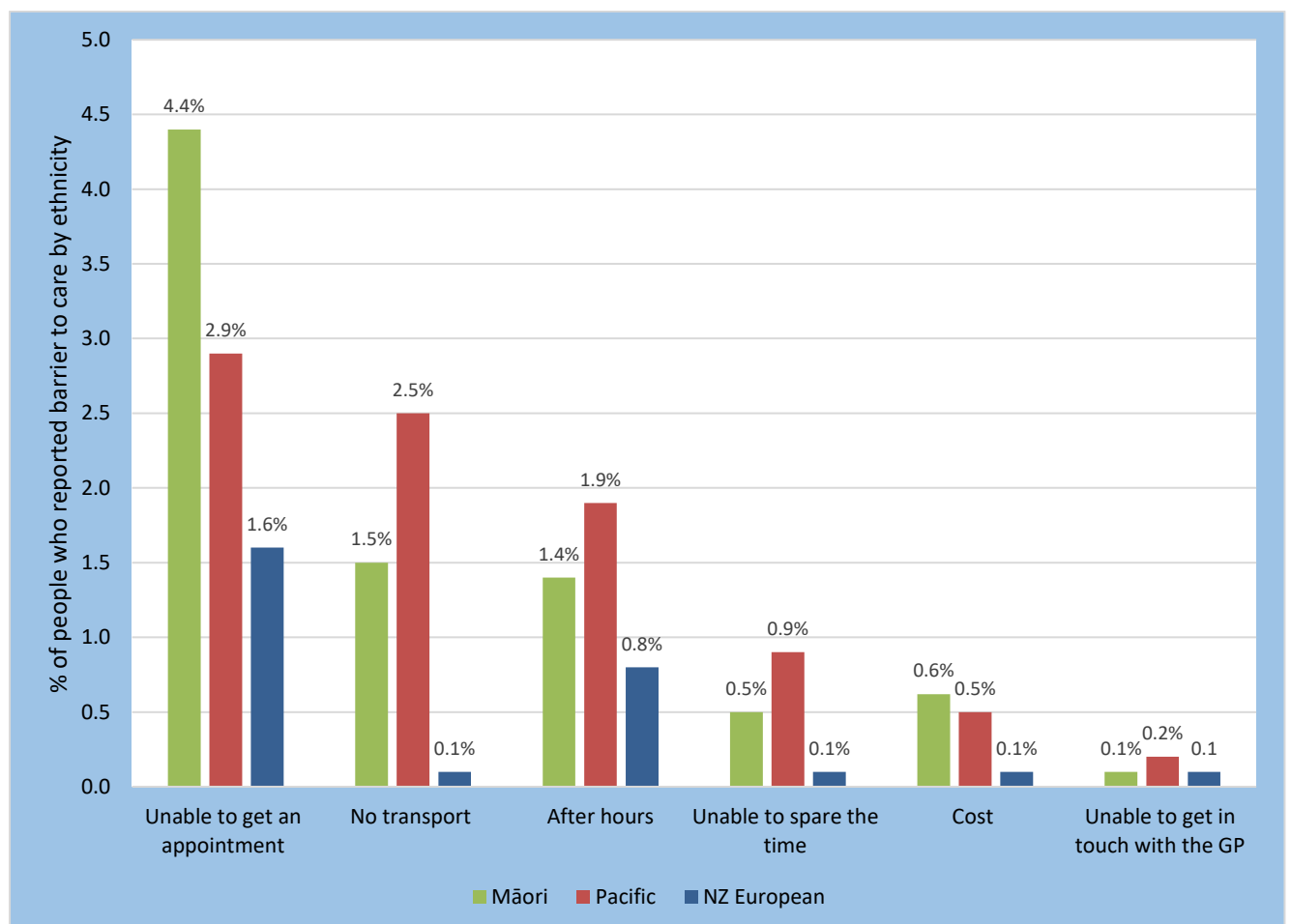
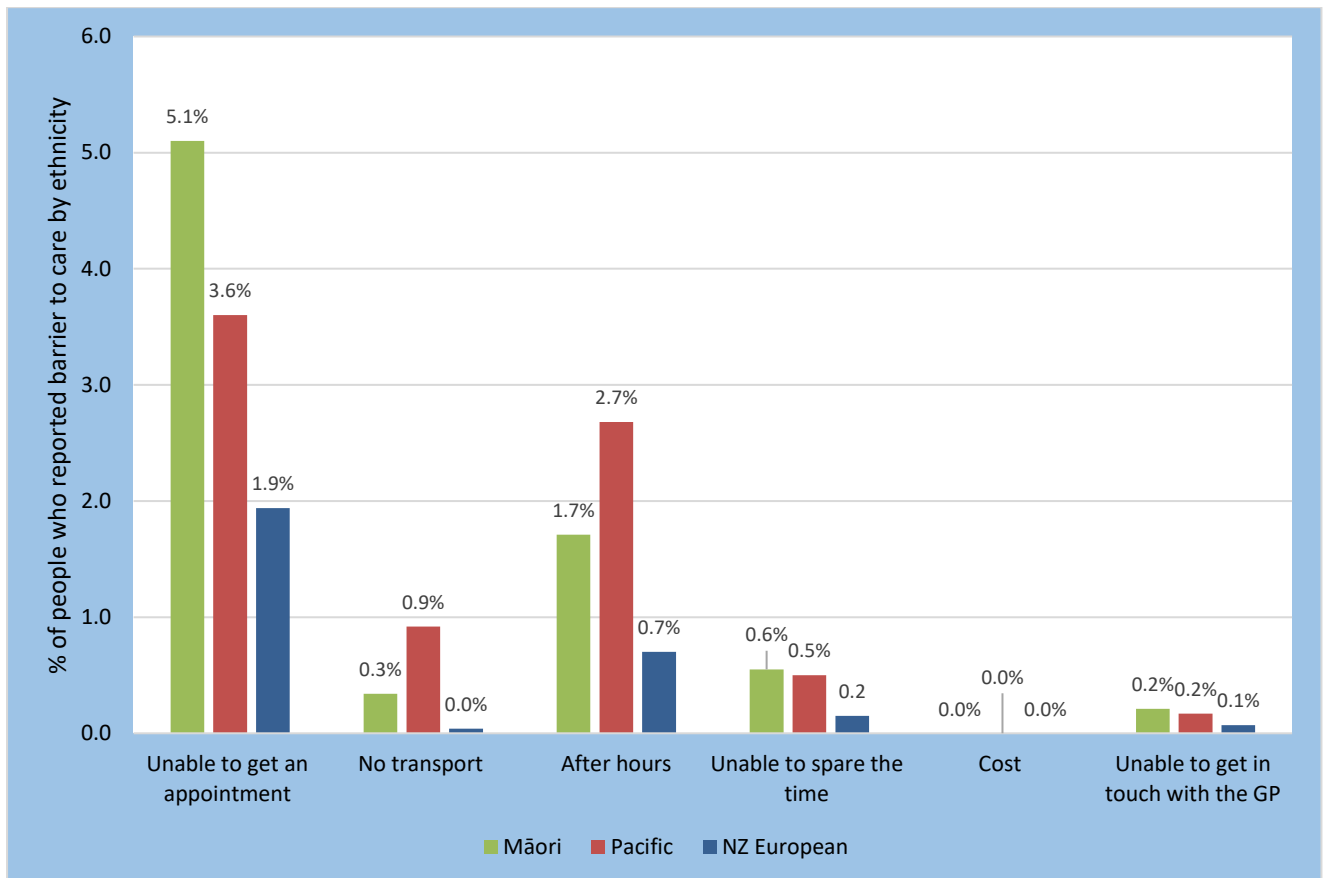
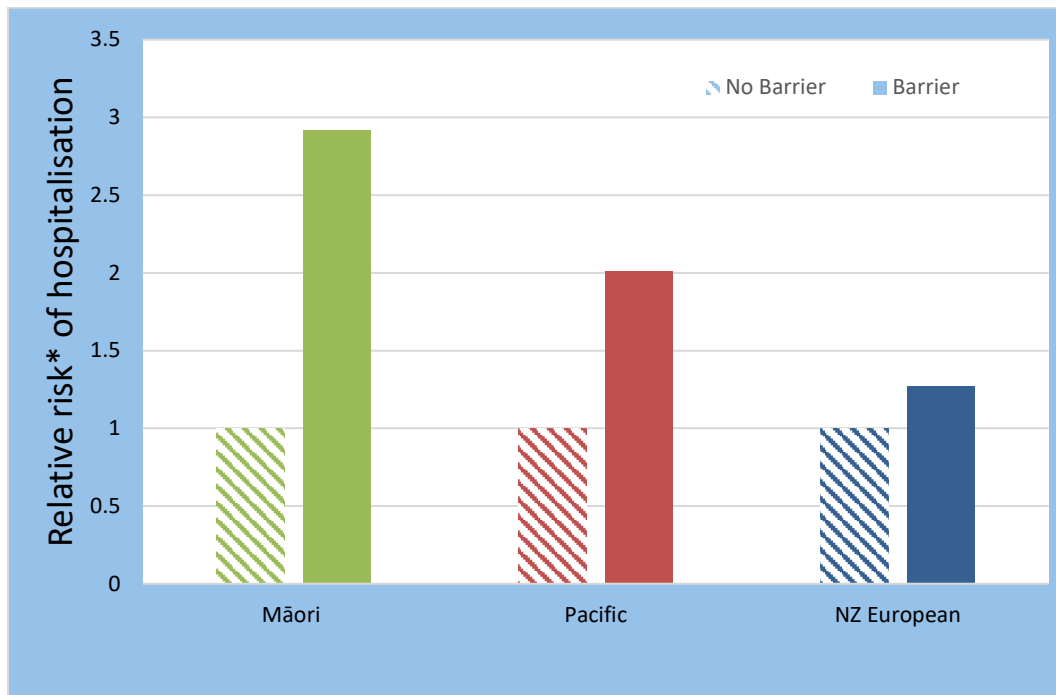


Figure 3: Type of barriers to see a GP at age 42 to 54 months.



- Among children who had faced a barrier reported at age 24 months, more Māori (49.6%) and Pacific (51.7%) families reported facing barriers on more than one occasion, compared to New Zealand European families (37.8%). A similar pattern was seen at age 54 months (Māori 48.5%; Pacific 49.1%; New Zealand European: 43.7%)
- Despite the zero-fees policy, fourteen (0.2%) mothers identified their child as not having seen a GP due to cost at age 12 to 24 months. This was more common for Māori (0.6%) and Pacific (0.5%) children than New Zealand European children (0.1%). At age 54 months, there were no reports of cost being a barrier to seeing a GP in the previous 12 months.
- Children whose mothers reported a barrier to seeing a GP at age 24 months were over twice as likely to have had a hospitalisation at age 42 to 54 months. When analysed by ethnicity, the association was only present for Māori and Pacific families, see Figure 4.

Figure 4: Association between barriers to care from age 12 to 24 months and hospitalisation in the 12 months prior to age 54 months



*Crude associations showing the odds ratio of the risk of hospitalisation among children whose mother reported a barrier to seeing a GP compared to those who did not report a barrier. The observed associations were not explained by demographic factors, social determinants of health, or maternal experience of racism in the health sector. Child's health explained part but not all the association.

Recommendations

- Despite the zero-fees policy, some young children do not see a GP when in need due to cost. Primary health organisations should ensure that all children who present for care are enrolled with a practice to ensure eligibility for free GP visits.
- Policy action is needed to address the barriers to accessing GP care for Māori and Pacific children, beyond focusing on cost. For example, the location of primary health care services and possibilities of outreach and/or mobile services could be considered, so that lack of transport is not a barrier to families.
- Changes to the health system, and future health policy, must align with contemporary interpretations of *Te Tiriti o Waitangi*, to ensure that health equity becomes a reality for Māori.

Introduction

Previous research on access to primary health care has found cost to be a persistent barrier to care in Aotearoa New Zealand, with Māori and Pacific peoples more likely to face barriers and have lower access to primary health care than people of New Zealand European ethnicity [2-5]. There is less evidence surrounding access to primary health care for children. Analysis of data from the B4School Checks show that children most in need are least likely to access these checks [6], and it is likely that there are parallels in inequities in accessing primary health care. Whānau involvement is particularly important when considering access to care for tamariki Māori [5]. Intergenerational responsibility for the care of children is considered a healthy norm and primary health care services need to be better prepared for the complexity of this.

Measures to improve access for children began in January 1997 with the introduction of free standard GP visits for under six-year olds [7]. The Primary Health Care Strategy (2001) set the direction for primary health care in Aotearoa New Zealand in the 2000s and 2010s. Among other initiatives, new funding was made available to improve access to primary health care [8]. The zero-fees policy for children has applied to after-hours care since 2012 [9], and the age band to which the policy applies has been progressively increased, to those aged under 13 in July 2015 [10], and aged under 14 in December 2018 [11]. As a consequence, cost as a reported barrier to primary health care for children, as documented in the New Zealand Health Survey (NZHS), has reduced in recent years [12], as have inequities in ambulatory-sensitive hospitalisation (ASH) rates for 0-4 years olds [1], suggesting that an improvement in access to primary health care can have an important impact on health equity.

Although changes to policy, in terms of reducing/eliminating fees, are important in removing a key barrier to access to care, the removal of co-payments has not removed all barriers to seeing a general practitioner (GP). The “cost” of seeing the GP is not only the co-payment made to the practice, but also the cost of travel or childcare and the “opportunity cost” of time off work [13, 14]. These barriers are not affected by the zero-fees policy. Opportunity cost affects different whānau differently, typically hitting those with fewest resources hardest. Furthermore, a cost barrier is only one of several barriers to seeing a GP. The prevalence among children under 15 who face any barrier to accessing GP care was reported in the NZHS of 2018/19 as 19.9%, equating to 189,000 children [12]. The prevalence was higher for tamariki Māori (24.7%, 58,000 tamariki) and Pacific children (25.6%, 33,000 children).

Evidence points to various forms of racism, including structural, systemic and interpersonal racism, being important drivers of inequities in access to care [15, 16]. An analysis of the NZHS found that the children of mothers who reported an experience of racism were twice as likely to face barriers to primary health care. This was not explained by measures of social determinants of health, and was partly but not fully mediated by maternal psychological distress [17]. An early analysis from the Growing Up in New Zealand (GUiNZ) study found that maternal experience of racism from health-care providers was associated with a two-fold higher rate of hospitalisation from infectious diseases among Pacific children in the first year of life [18].

There has been little research into the consequences of barriers to primary health care, although it is likely that that an inaccessible primary health system will result in higher secondary care usage. An Australian study found that inadequate community care services predicted higher levels of emergency room visits for individuals with physical conditions [19]. Previous analyses of barriers to primary health care in Aotearoa New Zealand have been based on qualitative interviews, or quantitative analyses of cross-sectional data [2, 5, 6, 13, 20]. From these cross-sectional data we cannot determine how persistent these barriers are, nor determine the consequences of these. The aim of this study is to analyse the persistence, determinants and consequences of barriers to seeing a GP in a contemporaneous cohort of children in Aotearoa New Zealand. We focus on access to general practice which is one key part of primary health care.

Methods

The study was based on an analysis of repeated waves of data collected from the mothers of children enrolled in GUiNZ, a contemporary child cohort study in Aotearoa New Zealand. Details of the cohort's design and methods have been reported elsewhere [21]. Briefly, pregnant women residing in three adjacent District Health Board (DHB) regions, Auckland, Counties Manukau and Waikato, with an expected delivery date between 25th April 2009 and 25th March 2010 were eligible for inclusion. Recruitment methods included informing women of the study through their lead maternity carer, as well as community actions to increase awareness and participation. Full details of the strategies used have been described elsewhere [22]. A total of 6,846 babies were included in the cohort, representing 35% of all live births in the three DHBs.

Data collection waves relevant to the analysis conducted here were computer-assisted face-to-face-interviews with the mother/primary caregiver when the child was 9 months (in 2010), 24 months (in 2011/12) and 54 months old (in 2013/14). At each of these data collection waves, children in the study were eligible for zero-fees GP visits. Secondary care is free for all citizens and residents in Aotearoa New Zealand.

Variables Used

The key outcome variables used were: i) facing a barrier to seeing a GP; ii) facing a barrier to receiving immunisations; and iii) having had a hospital admission for a range of non-injury related conditions.

Having faced a barrier to seeing a GP was defined as a positive response to the question "In the last 12 months, has there been any time when [child] needed to see a GP or family doctor about his/her health, but didn't get to see any doctor at all?". The same question was asked at 24- and 54-months.

Having faced a barrier to immunisation, reported at 24- and 54-months, was defined as a positive response to not having received all the 15-month or 48-month immunisations due to one of: cost, transport, baby being unwell, inability to get an appointment, or inconvenient clinic hours. There were additional questions covering reasons that babies were not fully immunised, relating to advice from health professional or parental choice. Since the focus of our analysis was on barriers to immunisations, these were not included as having faced a barrier.

Having been admitted to hospital in the previous 12 months was reported at 54 months. The relevant questions for hospital admissions related to specific health

conditions¹ and excluded injuries. ASH-related conditions were defined as a hospital admission in the previous 12 months of one or more of the following: ear infection, asthma/wheeze, whooping cough, gastroenteritis, eczema/dermatitis, skin infections or throat infection/tonsillitis. These were chosen as being the categories that were most closely related to the conditions used to define childhood ASH [23].

The sex of child was reported by the mother/caregiver at age 9 months. Maternal age was self-reported when the child was age 54 months. At that time, it ranged from age 20 to 50, and was analysed in five-year age bands. At that same timepoint, the child's ethnicity was reported by the mother/caregiver on behalf of the child. This could be reported as one or more ethnic groups, aligned with Ministry of Health Level 2 ethnicity [24], although New Zealander was also included as an option. Previous work has shown that the majority of people who report their ethnicity as New Zealander are New Zealand Europeans [25]. In this study, the New Zealander group were included in the 'Other' group, unless they also identified as another ethnicity. For analysis, the total Māori population was compared with non-Māori population and the total Pacific population compared with non-Pacific population. The New Zealand European group was defined as people who identified as New Zealand European, but did not identify as Māori or Pacific ethnicity.

Relevant primary health care measures used were i) having a regular GP or practice; ii) whether the mother/caregiver reported that the child's visit to the GP usually incurred fees; and iii) health care utilisation. At the 24- and 54-month timepoints, mothers/caregivers were asked to report how many times the child had seen a GP. Health was measured using maternal/ caregiver-reported child health at 24- and 54-months, in five categories (excellent, very good, good, fair, poor).

Various measures of social determinants of health were used. These included an area-based measure of material deprivation, based on place of domicile using measures from the 2006 (at age 24 months) and 2013 (at age 54 months) censuses; maternal employment at age 24 months; self-reported standard of living at age 24 months in five categories (low, fairly low, medium, fairly high, high); self-reported sufficiency of income at age 24 months in four categories (not enough, just enough, enough, more than enough); and overcrowding, defined as more than one person per room, measured at 9 months.

¹ Non-food allergies; hay-fever; ear infections; asthma; whooping cough (pertussis); other respiratory disorders including chest infections, bronchiolitis, bronchitis, pneumonia; cough lasting more than four weeks; wheezing in the chest; gastroenteritis (three or more watery or looser-than-normal bowel movements or diarrhoea within a 24 hour period); eczema or dermatitis; throat infection or tonsillitis; skin infections (where the skin is red or warm or painful or swollen, or there are pustules or boils, or crusting or oozing)

Statistical Analysis

The prevalence of barriers to seeing a GP and to immunisations were tabulated, and chi-squared tests used to test for differences between ethnic groups. The persistence of barriers from age 24 to age 54 months, the persistence of barriers across domains and the determinants of barriers to care were analysed using logistic regression, with the output reported as odds ratios (ORs) and associated 95% confidence intervals (CIs).

Possible mediators of the relationship between barriers to seeing a GP and subsequent hospitalisations were addressed through statistical adjustment using multivariable logistic regression models. Broadly, these included measures of social determinants of health, direct measures of health and measures of experience of racism in the health service.

Analyses were conducted for the total population, the total Māori population (i.e. Māori with or without another ethnicity) compared to non-Māori, and the total Pacific population (i.e. Pacific with or without another ethnicity) compared to non-Pacific. In some instances, comparisons were made between Māori (or Pacific) and the New Zealand European population.

Given the face-to-face nature of the data collection, there were only minimal levels of missing data. For those people who refused to answer questions or replied that they did not know, they were analysed in the baseline (i.e. non-exposed) group.

Results

The cohort included 6,847 children whose mother/ caregiver completed the questionnaire at 9 months, of whom 6,404 (93.5%) had child and maternal data recorded at age 24 months, and, of these, 5,947 (92.9%) had child and maternal records at age 54 months. Thus, the final sample for analysis was based on 5,947 children, which is 86.9% of the original cohort at 9 months. Included in this sample were 73 sets of twins, i.e. 146 individuals, pairs of whom had the same mother/primary care giver.

Description of cohort

Details of the cohort used for analysis are shown in Table 1. There were slightly more male babies included than female, but this did not differ by ethnicity. In the total cohort, 50% of mothers were over the age of 36 years; Māori and Pacific mothers were significantly younger. Across the total cohort, there were approximately one third of all mothers and babies living in the three DHBs of recruitment (Auckland, Counties Manukau and Waikato). This varied by ethnicity, with fewer Māori in Auckland DHB and over half of Pacific families in Counties Manukau.

The distribution of area-based deprivation reflects the total population, with about one fifth of the cohort in each quintile. Māori and Pacific people were significantly more likely to live in more deprived areas. Other socio-economic determinants of health were also unequally distributed by ethnicity: Māori and Pacific mothers/ caregivers were less likely to be in paid employment when their child was aged 24 months, less likely to report a high or fairly high standard of living, less likely to report that their income was enough or more than enough to live on, and more likely to live in overcrowded houses.

Most mothers/caregivers rated their children's health at 24 months as excellent, but the health of tamariki Māori was reported, on average, as lower than non-Māori. A similar pattern was seen at 54 months. Over 10% of the cohort saw a GP 12 or more times when aged 1 to 2, and this was higher for Māori and Pacific children. The overall pattern of GP visits was lower in the 12 months to age 54 months, but higher consultation rates remained evident for Māori and Pacific children, compared to non-Māori and non-Pacific children, respectively. Despite the zero-fees policy, when children were aged 24 months, over 16% of mothers/caregivers reported being charged for "standard doctor visits" for their child; this was lower for Māori (11%) and Pacific (7%) children. Māori were equally likely as non-Māori to be enrolled at a practice (as measured based on reported usually seeing the same GP, or a GP at the same practice), whereas Pacific children had lower enrolment rates, and were more likely to go to more than one practice, or use the hospital, than non-Pacific children. The overall prevalence of having experienced racism in the health sector was 1.2%, but this

was reported more frequently by mothers/caregivers of Māori (2.4%) and Pacific (2.2%) children.

Overall, at 54 months, 4% of the cohort had had a hospital stay for one of the specific conditions asked about; this was higher for Māori (5.3%) and Pacific (5.4%) children.

Description of barriers to seeing a GP at age 24 months and 54 months

A total of 279 children (4.7% of the cohort) reported facing a barrier to see a GP in the previous 12 months at age 24 months. This was more common in Māori compared to non-Māori (8.3% vs. 3.5%) and in Pacific compared to non-Pacific (7.0% vs. 4.1%) children. Among New Zealand European children, 77 (2.8%) reported having faced a barrier to seeing a GP. Most mothers/caregivers who reported this barrier (n=157, 56.3%) reported that this had happened only once in the last 12 months, 63 (22.6%) reported this happening twice, 45 (16.0%) three to five times and 12 (4.3%) more than five times. Two mothers/caregivers were not sure how many times it had happened in last 12 months. Māori mothers were more likely to report having faced a barrier more often than non-Māori, e.g. 26 (1.8%) reported facing a barrier three or more times, compared to 32 (0.7%) non-Māori, $P < 0.001$. Likewise, Pacific mothers reported more frequent barriers than non-Pacific mothers, 21 (1.7%) Pacific mothers reported facing a barrier three or more times, compared to 37 (0.8%) of non-Pacific mothers, $P < 0.001$.

Mothers/caregivers were given several options to describe the reason for not having seen a GP on the last occasion that this happened. Each of the possible reasons was broadly related to social determinants of health and wellbeing. The most common reason was not being able to get an appointment (n=142, 2.4%), followed by being after hours (n=62, 1.0%), not having transport (n=45, 0.8%), not being able to spare the time (n=18, 0.3%), cost (n=14, 0.2%), not being able to get in touch with the GP (n=7, 0.1%), and not having childcare (n=3, 0.1%). There were 67 people (1.1%) who reported another (unspecified) reason for their child not having seen a GP when needed at age 24 months. For each reason, the frequency was higher in Māori than non-Māori, and Pacific than non-Pacific families. The most marked differences in barriers were not being able to get an appointment for tamariki Māori and not having transport for Pacific families.

A total of 325 children (5.5% of the cohort) reported facing a barrier to see a GP at 54 months. This was more common in Māori compared to non-Māori (9.0% vs. 4.3%) and in Pacific compared to non-Pacific (9.1% vs. 4.6%) children. Among New Zealand European children, 87 (3.2%) had faced a barrier to seeing a GP. Most children who had this barrier reported (n=160, 51.7%) stated that

this had happened only once in the last 12 months, but 97 (29.9%) reported this happening twice, 47 (14.5%) three to five times, and 12 (3.7%) more than five times. For one child the response was “don’t know”.

When asked what the reason was for the barrier to seeing a GP at 54 months, the most common reason was not being able to get an appointment (n=174, 2.9%), followed by being after hours (n=75, 1.3%), not having transport (n=17, 0.3%), not being able to spare the time (n=15, 0.3%), and not being able to get in touch with the GP (n=7, 0.1%). No parents reported their child not having seen a GP due to cost or not having childcare. There were 37 (0.6%) people who reported another (unspecified) reason for their child not having seen a GP when needed at age 54 months.

For each reason, the frequency was higher in Māori than non-Māori, and Pacific than non-Pacific families. The most marked differences in barriers were not being able to get an appointment for tamariki Māori and being after hours for Pacific families.

Description of barriers to immunisation at age 24 months and 54 months

Mothers/caregivers of 74 children (1.2% of the cohort) reported at 24 months having faced a barrier to receiving immunisations due at 15 months. This was more common in Māori compared to non-Māori (2.5% vs. 0.8%) and in Pacific compared to non-Pacific (2.1% vs. 1.0%) children. Among New Zealand European children, 22 (0.8%) reported having faced a barrier to receiving 15-month immunisations. The most common reason was the baby being unwell (n=61, 1.0%), followed by appointment times being inconvenient (n=11, 0.2%), and not having transport (n=7, 0.1%). For two children, the reason was not being able to get an appointment.

Mothers/caregivers of 123 children (2.1% of the cohort) reported at 54 months having faced a barrier to receiving immunisations due at 48 months. This was more common in Māori compared to non-Māori (3.2% vs. 1.7%) and in Pacific compared to non-Pacific (2.9% vs. 1.9%) children. Among New Zealand European children, 42 (1.5%) reported having faced a barrier to receiving 48-month immunisations. The most common reason was the baby being unwell (n=97, 1.6%), followed by appointment times being inconvenient (n=15, 0.3%), and not having transport (n=10, 0.2%). For six children, the reason was not being able to get an appointment.

Persistence of barriers over time

There were 45 (0.8%) children who reported facing a barrier to see a GP at both ages. This was more common in Māori than non-Māori (1.6% vs. 0.5%) and Pacific than non-Pacific children (1.2% vs 0.7%).

Having faced a barrier to see a GP at 24 months was a strong predictor of continuing to face these barriers at 54 months in the total cohort, OR 3.67 (95%CI 2.61 to 5.16), and was particularly strong for New Zealand European children (OR 4.93, 95%CI 2.44 to 9.94). However, for Māori (OR 2.82, 95%CI 1.73 to 4.60) and Pacific (OR 2.19, 95%CI 1.19 to 4.04) children, facing a barrier at age 24 months was less strongly associated with facing a barrier at age 54 months. This suggests that for New Zealand European families, identifying children at age 24 months who face barriers to care will identify most of those children who are likely to face barriers at age 54 months. The evidence that this was different between Māori and non-Māori was weak, and differences may have been due to chance (P for interaction 0.46). For Pacific children, the evidence for a difference in predictive effect of facing a barrier at age 24 months between Pacific and non-Pacific children was somewhat stronger (P=0.063), indicating that factors other than having faced a previous barrier are likely to be important in understanding barriers at age 54 months.

Persistence of barriers across domains

There was no relationship between having faced a barrier to immunisation and having faced a barrier to see a GP in the previous 12 months at age 24 months (OR 1.16, 95%CI 0.42 to 3.21), at age 54 months (OR 1.37, 95%CI 0.69 to 2.72), or from age 24 to age 54 months (OR 1.25 95%CI 0.50 to 3.12). Similar results were found for Māori children. Among Pacific children, there was a suggestion that having faced a barrier to immunisation at age 24 months was associated with a higher risk of facing a barrier to a GP at age 54 months (OR: 2.58, 95%CI 0.95 to 7.03). However, this observation is likely to be due to chance: there was no evidence that barriers to immunisation at age 24 months were related to barriers to seeing a GP at age 24 months, and likewise no evidence that barriers to immunisation at age 54 months were related to barriers to seeing a GP at age 54 months.

In summary, there is no clear evidence of persistence of barriers across domains. Identifying children who have not been fully immunised will not be useful in identifying those who may be facing a barrier to seeing a GP.

Determinants of barriers at age 24 months

Univariable determinants of barriers at age 24 months are shown in Table 2. There was weak evidence that mothers/caregivers of girls were less likely to report facing a barrier than those of boys, although this was not the case for Pacific people. Barriers were more commonly reported by younger mothers and were more common in the Counties Manukau and Waikato DHB areas compared to Auckland DHB. Most measures of social determinants of health, including household overcrowding, area-level deprivation, household income and sufficiency of income, were related to facing a barrier. Maternal unemployment was associated with higher levels of barriers for Pacific mothers, and self-reported standard of living was not related to facing a barrier to seeing a GP. Children with poorer health and those who saw a GP more frequently were also more likely to report facing a barrier. Maternal experience of racism in the health sector was not related to reporting a barrier to seeing a GP.

In univariable analysis, Māori were over two and a half times more likely to report facing a barrier to seeing a GP than non-Māori (OR 2.58, 95%CI 1.99 to 3.35). Having adjusted for all the health and socio-demographic variables shown in Table 2, there remained an excess risk of 86% higher reporting of barriers for Māori compared to non-Māori, (OR 1.86, 95%CI 1.41 to 2.47).

Pacific children were 87% more likely to report facing a barrier to seeing a GP than non-Pacific children (OR 1.87, 95%CI 1.41 to 2.49). About half of this excess risk is accounted for by the health and socio-demographic variables shown in Table 2. In the fully adjusted model, there remained an excess risk of 45% higher reporting of barriers for Pacific compared to non-Pacific, (OR 1.45, 95%CI 1.03 to 2.04).

Determinants of hospitalisation at 54 months

Based on reports at age 54 months, 236 (4%) of children had been admitted to hospital in the previous 12 months for one of a range of conditions that was asked about. Hospitalisations were more common in Māori (5.3%) and Pacific (5.4%) than non-Māori (3.5%) and non-Pacific (3.6%) children respectively. Similar patterns were seen when the range of hospital admissions was restricted to those as close as possible to the definition of ASH; the overall prevalence was 3.1%, but this was more common in Māori (4.0%) compared to non-Māori (2.9%), $P=0.033$, and in Pacific (4.7%) compared to non-Pacific children (2.7%), $P=0.001$.

Girls, and children of older mothers, were less likely to have had a hospitalisation than boys, although this was not seen in Māori families. There were no differences in risk of hospitalisation based on DHB of domicile. There

were higher risks of hospitalisation in groups of people facing socio-economic hardships, including living in the most deprived areas, those living in more overcrowded houses, maternal unemployment, lower household income, lower income sufficiency and lower self-reported standard of living.

Poorer maternal-reported child health and a higher number of previous GP visits were associated with a higher risk of hospitalisation; the association between these measures at age 54 months was stronger than the same measures at age 24 months. Maternal experience of racism in the health sector was associated with a higher hospitalisation risk, but this did not reach conventional levels of statistical significance in Māori or Pacific analyses.

Association between barriers to care at age 24 months and hospitalisation at 54 months

Children whose mothers reported having had a barrier to seeing a GP at age 24 months were over twice as likely to have had a hospitalisation in the 12 months to age 54 months, OR 2.18 (95%CI: 1.38 to 3.44). There was no clear pattern of increasing hospitalisation rate with increasing missed opportunities to see a GP.

This association differed by ethnicity. The increased risk of hospitalisation associated with having faced a barrier to seeing a GP at age 24 months was most marked for Māori (OR 2.92, 95%CI: 1.60 to 5.30) and less marked but still strong for Pacific children (OR 2.01, 95%CI: 0.92 to 4.37). There was no relationship between barriers to seeing a GP at 24 months and hospitalisations in the 12 months prior to age 54 months for New Zealand European children (OR 1.27, 95%CI 0.39 to 4.12).

To address possible confounding by indication, since only children who need to see a GP can face a barrier, we repeated the analyses, restricting it to children who reported having seen a GP at least once at the age of 24 months. This made no material difference to the results for Māori (OR 2.90, 95%CI: 1.59 to 5.27); Pacific (OR 2.15, 95%CI: 0.98 to 4.69) or New Zealand European (OR 1.29, 95%CI 0.40 to 4.18) children.

Regarding ASH-related conditions, the effect showed a similar pattern to that of all hospitalisations, and the magnitude of the association was strengthened. Children who had faced a barrier two years earlier had a two and a half times higher risk of having a hospitalisation for an ASH-related condition in the 12 months prior to age 54 months, (OR 2.56, 95%CI 1.58 to 4.14). When the results were stratified by ethnicity, the effect was largest and the evidence strongest for Māori (OR 3.46, 95%CI 1.81 to 6.62); it was also strong for Pacific

children (OR 2.36, 95%CI 1.08 to 5.17), but not present for New Zealand European children, 1.78 (95%CI: 0.55 to 5.82).

Possible mediators of the relationship between barriers to seeing a GP and risk of hospitalisation were investigated. The observed associations were not explained by demographic factors, social determinants of health, or maternal experience of racism in the health sector. A child's health explained part but not all of the association, see Table 4. Overall, and for Māori and Pacific children, there remained a 60% higher risk of hospitalisation among those people who had faced a barrier to seeing a GP.

In summary, having faced a barrier to seeing a GP in early childhood is related to an elevated risk of having been hospitalised in the 12 months prior to age 54 month. Socio-demographic variables do not appear to explain this association, and the results appear to be only partly mediated through measures of child health.

Discussion

Our analysis has identified that barriers to seeing a GP are higher for Māori and Pacific children than New Zealand European children, and that for these children, the barriers are more likely to persist from age 24 to 54 months. Facing a barrier to seeing a GP at age 12 to 24 months for Māori and Pacific children is associated with a higher rate of hospitalisation from various illnesses at age 42 to 54 months, but this is not the case for New Zealand European children. This latter relationship is independent of various measures of social determinants of health and maternal experience of racism within the health sector. It is partly mediated through maternal/caregiver-reported child health. Given the higher rates of experiencing barriers to seeing a GP for Māori and Pacific children, the impact for these children will be particularly high.

The strengths of the study include the large cohort of children, with sufficient numbers, particularly of Pacific children, for robust analyses; the high retention rate from antenatal to 54-month follow-up; and the face-to-face data collection with a resulting small amount of missing data. The GUiNZ cohort is representative, in terms of Māori ethnicity, of the births in Aotearoa New Zealand. In the 2013 census [26], the proportion of three-year olds (i.e. those closest in age to the cohort members) who were Māori was 24%, compared to 25% Māori in the current analysis. The census reported only 13% of births being Pacific, compared to 20% in the current analysis, possibly due to the DHBs recruited for the inclusion criteria, in which a high proportion of the Pacific families in Aotearoa New Zealand live.

There are few limitations in the study. Both the ascertainment of exposure (whether or not a child faced a barrier to seeing a GP) and outcome (hospitalisation) relied on recall, but any misclassification is likely to be non-differential, thus potentially biasing the results towards the null, but unlikely to cause any spurious associations. The mothers/caregivers answering the survey were asked specifically about seeing a GP. Practice nurses, and increasingly nurse practitioners play a key role in the provision of primary health care. Although it is likely that the same barriers faced in seeing a GP would apply to the wider team, we were not able to test this empirically.

The analysis is limited in our understanding of the context in which the children facing barriers are living. The most common reason for not seeing a GP when in need was not being able to get an appointment. No further information on this is available, but this is clearly an important area that needs further examination. As receptionists act as gate-keepers in access to appointments [27], they may

demonstrate unconscious bias in interpersonal communications that affect people's access to care. A recent analysis of the Primary Care Patient Experience Survey reported that 91% of respondents agreed that reception and administration staff always treated them with respect; however the results were not reported by ethnicity of the patient [28]. Mothers are the primary mediation point between child and service and the role of the mother as the child's advocate is very important; other family members can also play this role, and this is more likely in Māori and Pacific households.

Key to understanding the impact of our work is a consideration of whether the hospitalisations which have been analysed could have been avoided. One of the system level measures reported at DHB level is ASH; data to March 2020 reported ASH rates of about 7.7% for Māori and 11.7% for Pacific children aged 0-4 years [29]; in comparison the GUINZ data that was most closely related to ASH show levels of 4.0% for Māori and 4.7% for Pacific children at age 54 months. This may reflect that the cohort participants are healthier than the general population. The proportion of hospitalisations that are avoidable, if general practice appointments were fully accessible, was particularly high for Pacific children. Furthermore, although we only measured hospitalisations in this study, there is likely to be detrimental social and educational [30] outcomes for children who are hospitalised in infancy, as well as impacts on siblings, parents and the wider family [31].

We found that barriers to seeing a GP are associated with a higher risk of hospitalisation between 42 and 54 months in Māori and Pacific children, but not in New Zealand European children. Why this should be is not clear. New Zealand European children who face barriers are more likely to have done so only once, whereas Māori and Pacific children are more likely to have faced a barrier on more than one occasion. One possible explanation is that New Zealand European children who face a barrier to seeing a GP are more likely to be hospitalised sooner, as we do not have a measure of hospitalisation between 24 and 42 months.

Using a privilege lens, we ask the question: what makes the health system work so much better for Pākehā [New Zealand European] families? One important factor is racism within the health system. Self-reported experience of racism did not explain the observed associations between barriers to care and hospitalisations. However, that measure is likely to be imperfectly measured, as individuals may not be aware of the effect that unconscious bias of a health professional on their access to or receipt of care. This could lead to residual confounding. Furthermore, institutional racism is harder to measure, and is acknowledged as present and a cause of inequities in health in Aotearoa New

Zealand [32]. Additionally, racism and unconscious bias are likely to be extended to the child through maternal/caregiver ethnicity, as the mother/caregiver is the usual mediating point between infant and the health service.

Each of the possible reasons for not being able to get an appointment connect to social determinants of health and wellbeing. Health services contribute to health improvement [8], but the social determinants of child health are paramount to improving wellbeing. Although poverty shapes access and experience of the determinants of health, it also intersects with various forms of racism – including the forms we see in the health sector. Whānau and adults who are better equipped to mitigate racism across the health sector tend to better understand how this manifests in complex ways and how to 'respond'. There is evidence to suggest a stronger cultural identity leads to stronger self-esteem and personal wellbeing [33], which is likely to be a better point from which to navigate racism in the health sector.

An important question is what factors may mitigate the negative impacts of barriers to seeing a GP at a structural level? Māori health providers offer services which are aligned to kaupapa Māori theory and Māori models of health and are likely to ensure better long-term engagement and subsequent health outcomes for Māori. Within the mainstream health system, increasing diversity of the workforce is likely to have a beneficial outcome. Ongoing work has identified Cultural Safety as a key mechanism through which the health sector can act at multiple levels to address health inequity [34-36]. Cultural Safety has long been a feature of nursing education in Aotearoa New Zealand, but has only recently been adopted by the Medical Council of New Zealand, who have stated that cultural competency is insufficient to address health inequity [37]. It is imperative that this is not only legislated at the health professional level, but also recognised at health system and inter-sectoral policy levels for greatest impact.

In summary, we have reported a high prevalence of barriers to seeing a GP at age 12 to 24 and 42 to 54 months, which are not reflected in reported barriers to immunisations. Although for some children these barriers persist, for others they occur for the first time around the age of school entry. For Māori and Pacific children, the barriers at age 12 to 24 months are associated with a higher chance of hospitalisation at age 42 to 54 months. Policies to address accessibility of the primary health care system, in particular seeing a GP, for Māori and Pacific children, beyond focusing on cost, are required to address inequities in hospitalisations. Changes to the health system, and future health policy, must

align with contemporary interpretations of *Te Tiriti o Waitangi*, to ensure that health equity becomes a reality for Māori.

Limitations and future directions

The disproportionate experience of barriers to seeing a GP amongst caregivers of Māori and Pacific children is an important example of inequity in the provision of health care in Aotearoa New Zealand. These barriers have been shown here to be associated with more or delayed hospitalisations for Māori and Pacific children, but not in New Zealand European children. It could be that the impact of facing a barrier is lower in New Zealand European children, or that these children were hospitalised in the intervening period (i.e. 24 to 42 months), sooner than Māori and Pacific children. Whichever, this has health, social and cost implications for whānau/families and the health system.

The persistence of these inequities directly challenges the guarantee of equity for Māori, *oritetanga*, as emphasised in the third article of *Te Tiriti o Waitangi*. The recent WAI 2575 report [38] found the Crown in breach of *Te Tiriti*, given the failure of the legislative and policy framework to deliver equitable health outcomes for Māori. Specific recommendations to address this breach have been clearly articulated by Came et al [39].

Health system efforts to remove these barriers have centred on the zero fees policy for children seeing a GP. We report a range of barriers beyond cost, which may have become more prominent since cost barriers have reduced. 'Inability to get an appointment' was the most common barrier to seeing a GP, particularly for Māori. Further qualitative work exploring the impact of these barriers is needed, including development of previous work on the role that receptionists and other front-line staff play in facilitating or acting as a potential barrier to appointments [40].

Policy makers should consider how to reduce these barriers to promote enhanced use of primary health care services and to reduce hospital admissions amongst children. Research and policy focused on improving access to GPs for Māori and Pacific people should be prioritised. Although our analyses focus on children, access for children is navigated by parents/ caregivers. In this role, challenges that parents face in accessing the system compound and shape their ability to advocate for an inaccessible system. The implications of this work therefore extend beyond children to all people.

To achieve the aspiration of health equity, requires, among other actions, a re-orientation of the primary health care system, in terms of co-design, pro-equity funding levels, elimination of institutional racism and meaningful Māori representation at all levels of the health system. Inequity is ingrained throughout our social systems, with direct impact on the social determinants of health. To fully address social and concomitant health inequity, a transformative, system-change approach is required [41].

Table 1: Description of cohort of 5,947 children who remained part of the Growing Up in New Zealand study

	Age at which variable measured	Māori (n=1,461)		Pacific (n=1,193)		Total Cohort (n=5,947)	
		n	%	n	%	n	%
Sex	9 months						
Male		757	51.8	614	51.5	3,059	51.4
Female		704	48.2	579	48.5	2,888	48.6
P-value			0.74		0.98		
Maternal Age	54 months						
25 or under		204	14.0	173	14.5	408	6.9
26 to 30		337	23.1	286	24.0	931	15.6
31 to 35		377	25.8	331	27.8	1,602	26.9
36 to 40		329	22.5	251	21.0	1,920	32.3
41 or over		209	14.3	151	12.7	1,081	18.2
Missing		5	0.3	1	0.1	5	0.1
P-value			<0.001		<0.001		

DHB of domicile	24 months						
Auckland		266	18.2	305	25.6	1,755	29.5
Counties Manukau		494	33.8	634	53.1	1,924	32.4
Waikato		534	36.6	121	10.1	1,577	26.5
Waitemata		37	2.5	36	3.0	214	3.6
Other/missing		130	8.9	97	8.1	477	8.0
P-value			<0.001		<0.001		
NZDep2006	24 months						
1 (least deprived)		171	11.7	48	4.0	1,090	18.3
2		197	13.5	94	7.9	1,097	18.5
3		239	16.4	121	10.1	1,031	17.3
4		324	22.2	247	20.7	1,164	19.6
5 (most deprived)		478	32.7	615	51.6	1,349	22.7
Missing		52	3.6	68	5.7	216	3.6
P-value			<0.001		<0.001		
Overcrowding	9 months						

Income sufficiency	24 months						
Not enough		188	12.9	186	15.6	579	9.7
Just enough		489	33.5	456	38.2	1,885	31.7
Enough		505	34.6	374	31.4	2,154	36.2
More than enough		246	16.8	124	10.4	1,204	20.3
Missing		33	2.3	53	4.4	125	2.1
P-value			<0.001		<0.001		
Standard of living	24 months						
High		102	7.0	51	4.3	564	9.5
Fairly high		341	23.3	197	16.5	1,702	28.6
Medium		819	56.1	733	61.4	3,066	51.6
Fairly low		143	9.8	136	11.4	410	6.9
Low		19	1.3	20	1.7	67	1.1
Missing		37	2.5	56	4.7	138	2.3
P-value			<0.001		<0.001		
Experience of racism in health sector	24 months						
Yes		35	2.4	26	2.2	70	1.2

No		1,426	97.6	1,167	97.8	5,877	98.8
P-value			<0.001		<0.001		
Child's health	24 months						
Excellent		708	48.5	627	52.6	3,036	51.1
Very good		478	32.7	374	31.4	1,960	33.0
Good		160	11.0	103	8.6	612	10.3
Fair		71	4.9	35	2.9	191	3.2
Poor		12	0.8	3	0.3	28	0.5
Missing		32	2.2	51	4.3	120	2.0
P-value			<0.001		0.13		
Child's health	54 months						
Excellent		705	48.3	593	49.7	3,036	51.1
Very good		519	35.5	419	35.1	2,050	34.5
Good		194	13.3	153	12.8	709	11.9
Fair		37	2.5	26	2.2	132	2.2
Poor		6	0.4	2	0.2	16	0.3
Missing		0		0		4	0.1

P-value			0.064		0.68		
GP visits in last 12 months	24 months						
0		28	1.9	13	1.1	119	2.0
1-2		266	18.2	212	17.8	1225	20.6
3-5		588	40.3	459	38.5	2427	40.8
6-11		356	24.4	311	26.1	1418	23.8
12+		182	12.5	134	11.2	603	10.1
Missing		41	2.8	64	5.4	155	2.6
P-value			0.003		0.001		
GP visits in last 12 months	54 months						
0		0		0		0	
1-2		441	30.2	345	28.9	1908	32.1
3-5		572	39.2	496	41.6	2365	39.8
6-11		244	16.7	207	17.4	981	16.5
12+		121	8.3	78	6.5	330	5.6
Missing		83	5.7	67	5.6	363	6.1

P-value			<0.001		0.028		
Hospital stay in last 12 months	54 months						
Yes		77	5.3	64	5.4	236	4.0
No		1,384	94.7	1,129	94.6	5,711	96.0
P-value			0.003		0.006		
See a regular GP							
Yes, one practice		1,349	92.3	1,073	89.9	5,553	93.4
Yes, more than one practice		33	2.3	43	3.6	131	2.2
No, use hospital		7	0.5	7	0.6	17	0.3
No, use after hours		20	1.4	12	1.0	61	1.0
Missing		52	3.6	58	4.9	185	3.1
P-value			0.17		<0.001		
Usually pay to see GP							
Yes		157	10.8	82	6.9	975	16.4
No		1,256	86.0	1,053	88.3	4,786	80.5

Missing		48	3.3	58	4.9	186	3.1
P-value			<0.001		<0.001		

* Based on child’s ethnicity, as reported by the mother/caregiver at age 54 months. The Māori and Pacific groups are total Māori and total Pacific, not based on prioritised ethnicity, and therefore some people are in both columns. P values relate to chi-squared tests comparing Māori with non-Māori and Pacific people with non-Pacific, excluding people with missing data.

Table 2: Number and proportion of mothers/caregivers who reported their child having faced a barrier to see a GP at age 24 and 54 months

	Age 24 months				Age 54 months			
	Total Cohort	Māori	Pacific	NZ European	Total Cohort	Māori	Pacific	NZ European
Cost	14 (0.2%)	9 (0.6%)	6 (0.5%)	2 (0.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Unable to get an appointment	142 (2.4%)	64 (4.4%)	35 (2.9%)	44 (1.6%)	174 (2.9%)	74 (5.1%)	43 (3.6%)	53 (1.9%)
Being after hours	62 (1.0%)	21 (1.4%)	23 (1.9%)	21 (0.8%)	75 (1.3%)	25 (1.7%)	32 (2.7%)	19 (0.7%)
No transport	45 (0.8%)	22 (1.5%)	30 (2.5%)	3 (0.1%)	17 (0.3%)	5 (0.3%)	11 (0.9%)	1 (0.04%)
Unable to spare the time	18 (0.3%)	7 (0.5%)	11 (0.9%)	2 (0.1%)	15 (0.3%)	8 (0.6%)	6 (0.5%)	4 (0.2%)
Unable to get in touch with the GP	7 (0.1%)	2 (0.1%)	2 (0.2%)	2 (0.1%)	7 (0.1%)	3 (0.2%)	2 (0.2%)	2 (0.1%)

Table 3: Determinants of having faced a barrier to primary health care at age 24 months

	Māori		Pacific		Total Cohort	
	OR	95%CI	OR	95%CI	OR	95%CI
Child's sex						
Male	1*		1*		1*	
Female	0.69	0.47 to 1.00	0.99	0.63 to 1.54	0.82	0.64 to 1.04
Maternal age						
25 or under	1*		1*		1*	
26 to 30	0.80	0.47 to 1.35	0.64	0.34 to 1.21	0.60	0.40 to 0.91
31 to 35	0.45	0.25 to 0.70	0.52	0.28 to 0.99	0.41	0.28 to 0.61
36 to 40	0.39	0.21 to 0.71	0.52	0.26 to 1.04	0.34	0.23 to 0.51
41 or over	0.35	0.17 to 0.72	0.21	0.07 to 0.62	0.27	0.17 to 0.43
DHB of domicile						
Auckland	1*		1*		1*	
Counties Manukau	1.40	0.78 to 2.50	1.34	0.76 to 2.33	1.38	0.99 to 1.92
Waikato	1.55	0.87 to 2.73	1.28	0.56 to 2.94	1.86	1.34 to 2.58
Waitemata	1.78	0.56 to 5.60	1.99	0.64 to 6.25	1.36	0.69 to 2.70

Other	1.22	0.46 to 3.21	1.18	0.26 to 5.36	1.68	0.94 to 3.00
NZDep						
1 (least deprived)	1*		1*		1*	
2	0.54	0.20 to 1.41	1.55	0.16 to 15.31	1.10	0.66 to 1.85
3	1.26	0.58 to 2.71	3.78	0.47 to 30.67	2.06	1.29 to 3.28
4	1.11	0.53 to 2.34	4.37	0.57 to 33.27	2.13	1.36 to 3.36
5 (most deprived)	2.13	1.09 to 4.15	3.98	0.54 to 29.47	3.10	2.03 to 4.75
Overcrowding						
Yes	1.23	0.85 to 1.78	1.35	0.81 to 2.26	1.40	1.10 to 1.79
No	1*		1*		1*	
Maternal employment						
Yes	1*		1*		1*	
No	1.13	0.78 to 1.65	1.58	0.99 to 2.53	1.06	0.84 to 1.35
Household income						
Up to \$50k	1*		1*		1*	

\$50,001 to \$70k	0.90	0.53 to 1.52	0.51	0.25 to 1.03	0.66	0.46 to 0.96
\$70,001 to \$100k	0.69	0.40 to 1.21	0.69	0.36 to 1.31	0.65	0.46 to 0.92
More than \$100k	0.56	0.32 to 0.97	0.33	0.14 to 0.78	0.38	0.27 to 0.54
Standard of living sufficiency						
Not enough	1*		1*		1*	
Just enough	0.78	0.46 to 1.32	0.66	0.38 to 1.15	0.61	0.43 to 0.89
Enough	0.53	0.31 to 0.93	0.29	0.14 to 0.58	0.51	0.35 to 0.74
More than enough	0.47	0.24 to 0.92	0.65	0.30 to 1.43	0.46	0.30 to 0.70
Standard of living						
High	1*		1*		1*	
Fairly high	0.85	0.35 to 2.06	1.04	0.33 to 3.25	0.96	0.59 to 1.56
Medium	1.51	0.68 to 3.36	0.81	0.28 to 2.33	1.29	0.82 to 2.01
Fairly low	1.13	0.42 to 3.02	1.35	0.42 to 4.31	1.53	0.85 to 2.73
Low	0.75	0.09 to 6.51	0.62	0.06 to 5.90	1.10	0.32 to 3.77
Maternal-reported child health						
Excellent	1*		1*		1*	

Very good	1.61	1.03 to 2.52	1.58	0.69 to 2.60	1.60	1.21 to 2.11
Good	2.95	1.72 to 5.05	2.44	1.25 to 4.79	2.67	1.89 to 3.78
Fair	4.10	2.11 to 7.98	1.59	0.46 to 5.43	3.36	2.03 to 5.57
Poor	1.51	0.19 to 12.05	-		2.21	0.52 to 9.45
GP visits in last 12 mths						
0	0.62	0.08 to 4.88	2.86	0.32 to 25.71	0.96	0.29 to 3.20
1-2	1*		1*		1*	
3-5	1.25	0.68 to 2.31	2.83	1.17 to 6.85	1.79	1.20 to 2.66
6-11	1.77	0.94 to 3.32	2.74	1.10 to 6.85	2.11	1.39 to 3.21
12+	3.04	1.57 to 5.88	4.66	1.77 to 12.22	3.67	2.34 to 5.74
Maternal experience of racism						
Yes	1.04	0.31 to 3.44	2.50	0.84 to 7.44	1.92	0.83 to 4.48
No	1*		1*		1*	

Table 4: Determinants of hospitalisations at age 54 months

	Māori		Pacific		Total Cohort	
	OR	95%CI	OR	95%CI	OR	95%CI
Child's sex						
Male	1*		1*		1*	
Female	0.80	0.50 to 1.27	0.46	0.27 to 0.80	0.67	0.51 to 0.87
Maternal age						
25 or under	1*		1*		1*	
26 to 30	1.69	0.80 to 3.57	0.95	0.47 to 1.90	1.03	0.64 to 1.66
31 to 35	0.86	0.38 to 1.93	0.43	0.19 to 0.95	0.48	0.30 to 0.78
36 to 40	0.80	0.34 to 1.86	0.52	0.23 to 1.18	0.55	0.34 to 0.87
41 or over	1.08	0.45 to 2.60	0.39	0.14 to 1.11	0.41	0.24 to 0.70
DHB of domicile						
Auckland	1*		1*		1*	
Counties Manukau	0.65	0.36 to 1.18	0.44	0.25 to 0.78	0.83	0.59 to 1.17
Waikato	0.55	0.30 to 1.01	0.46	0.17 to 1.23	1.25	0.90 to 1.74
Waitemata	0.32	0.04 to 2.48	0.63	0.14 to 2.78	0.93	0.44 to 1.97

Other	0.63	0.21 to 1.90	0.79	0.18 to 3.53	0.76	0.36 to 1.59
NZDep						
1 (least deprived)	1*		1*		1*	
2	1.22	0.38 to 3.93	2.64	0.30 to 23.26	0.77	0.46 to 1.27
3	2.22	0.79 to 6.24	2.03	0.23 to 17.81	1.15	0.73 to 1.83
4	1.84	0.67 to 5.08	3.26	0.42 to 25.14	1.51	0.98 to 2.31
5 (most deprived)	2.38	0.91 to 6.22	2.66	0.36 to 19.92	1.55	1.03 to 2.35
Overcrowding						
Yes	0.95	0.60 to 1.51	1.07	0.62 to 1.85	1.33	1.02 to 1.73
No	1*		1*		1*	
Maternal employment						
Yes	1*		1*		1*	
No	1.31	0.82 to 2.08	1.31	0.77 to 2.22	1.33	1.02 to 1.73
Household income						
Up to \$50k	1*		1*		1*	

\$50,001 to \$70k	0.90	0.48 to 1.71	0.95	0.45 to 2.03	0.86	0.58 to 1.27
\$70,001 to \$100k	0.62	0.31 to 1.26	0.58	0.23 to 1.43	0.72	0.49 to 1.06
More than \$100k	0.60	0.31 to 1.16	1.16	0.56 to 2.42	0.54	0.38 to 0.78
Standard of living sufficiency						
Not enough	1*		1*		1*	
Just enough	0.23	0.12 to 0.45	0.36	0.18 to 0.72	0.55	0.37 to 0.82
Enough	0.39	0.22 to 0.69	0.50	0.26 to 0.98	0.45	0.31 to 0.67
More than enough	0.29	0.13 to 0.62	0.56	0.23 to 1.38	0.46	0.30 to 0.72
Standard of living						
High	1*		1*		1*	
Fairly high	1.13	0.37 to 3.48	1.45	0.31 to 6.75	1.05	0.61 to 1.83
Medium	1.32	0.46 to 3.77	1.45	0.34 to 6.18	1.47	0.88 to 2.46
Fairly low	2.24	0.70 to 7.17	0.94	0.18 to 4.98	1.48	0.75 to 2.90
Low	6.53	1.47 to 28.95	2.72	0.36 to 20.79	3.75	1.50 to 9.42
Child health at 24 months						
Excellent	1*		1*		1*	

Very good	2.57	1.41 to 4.66	1.96	1.10 to 3.49	1.44	1.06 to 1.97
Good	4.26	2.12 to 8.55	2.21	0.96 to 5.09	2.53	1.73 to 3.69
Fair	6.28	2.78 to 14.21	3.39	1.10 to 10.40	3.79	2.25 to 6.37
Poor	12.78	3.19 to 51.19	n/a		5.72	1.94 to 16.83
GP visits, 12-24 months						
0-2	1*		1*		1*	
3-5	6.21	1.46 to 26.47	1.93	0.77 to 4.80	1.52	0.98 to 2.36
6-11	10.55	2.47 to 45.04	2.24	0.88 to 5.74	2.33	1.49 to 3.65
12+	24.33	5.70 to 103.87	3.92	1.45 to 10.58	5.00	3.15 to 7.94
Child health at 54 months						
Excellent	1*		1*		1*	
Very good	3.37	1.60 to 7.11	2.47	1.23 to 4.97	2.19	1.55 to 3.09
Good	15.30	7.42 to 31.54	6.71	3.26 to 13.83	5.65	3.92 to 8.12
Fair	16.22	5.77 to 45.55	19.83	7.31 to 53.79	13.68	8.31 to 22.53
Poor	13.90	1.49 to 130.04	44.62	2.64 to 752.85	17.73	5.55 to 56.70
GP visits, 42-54 months						

0-2	1*		1*		1*	
3-5	20.11	2.71 to 148.99	2.56	0.94 to 6.96	3.94	2.33 to 6.68
6-11	50.23	6.76 to 373.11	8.92	3.35 to 23.76	9.08	5.33 to 15.47
12+	114.58	15.34 to 855.94	14.88	5.18 to 42.74	24.72	14.21 to 42.99
Maternal experience of racism						
Yes	1.71	0.51 to 5.72	1.49	0.34 to 6.43	2.30	0.99 to 5.37
No	1*		1*		1*	

Table 5: Association between barrier to primary health care at age 24 months and risk of hospitalisations at 54 months

	Māori (n=1,200)		Pacific (n=941)		Total Cohort (n=4,927)	
	OR	95%CI	OR	95%CI	OR	95%CI
Crude association[#]	2.55	1.31 to 4.93	2.27	0.98 to 5.27	2.01	1.21 to 3.31
Adjusted for demographic factors						
+ child's sex	2.40	1.24 to 4.67	2.12	0.94 to 5.15	1.95	1.18 to 3.23
+ maternal age	2.45	1.25 to 4.79	2.10	0.89 to 4.93	1.84	1.11 to 3.05
+ child's ethnicity	n/a		n/a		1.80	1.08 to 2.99
+ DHB of domicile	2.63	1.35 to 5.10	2.37	1.01 to 5.55	1.95	1.18 to 3.32
Adjusted for social determinants of health						
+ NZDep quintiles	2.43	1.24 to 4.73	2.20	0.94 to 5.13	1.88	1.13 to 3.12
+ overcrowding	2.56	1.32 to 4.95	2.26	0.97 to 5.25	1.97	1.19 to 3.26
+ maternal employment	2.52	1.30 to 4.89	2.21	0.95 to 5.17	2.00	1.21 to 3.31
+ household income	2.44	1.26 to 4.75	2.30	0.98 to 5.39	1.86	1.12 to 3.08
+ standard of living sufficiency	2.42	1.23 to 4.75	2.10	0.88 to 5.00	1.85	1.12 to 3.08
+ standard of living rating	2.59	1.33 to 5.06	2.40	1.03 to 5.61	1.96	1.18 to 3.24

Adjusted for measures of health						
+ child health (24M) ##	1.94	0.98 to 3.84	2.03	0.87 to 4.77	1.72	1.03 to 2.86
+ GP visits in last 12 months (24M) *	2.07	1.05 to 4.10	2.00	0.86 to 4.70	1.75	1.05 to 2.91
+ child health (54M)	1.56	0.77 to 3.15	1.64	0.97 to 2.75	1.64	0.97 to 2.75
+ GP visits in last 12 months (54M) *	2.02	1.00 to 4.07	2.80	1.14 to 6.88	1.85	1.10 to 3.13
Adjusted for racism in health service						
+ maternal experience of racism	2.55	1.32 to 4.94	2.27	0.98 to 5.28	1.99	1.20 to 3.28

Based on a complete case analysis, excluding missing data for all other variables in the table, which explains the difference between the results in the table and text; ## Upper two categories of child health collapsed due to instability in the model of Pacific children; * lower two categories combined (no visits and one visit in past year) due to small numbers

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